

# Distributed Application as a new application Standard

~ Types of distributed applications and possible uses for construction companies ~

**Asist. Univ.drd. Gabriel Eugen GARAI**

## **Abstract**

*The constant growth in IT field more precisely the Internet, determines the need of new technologies and applications which can provide new possibilities and accessibility to the contemporaneous information society.*

*The field of construction, isn't a domain that has not information systems but there is still one way to distribute information for this domain that isn't enough developed. The way to distribute processed information for this domain can be the Internet.*

*This paper describes the way to develop an application that easy the process of centralization, distribution, and analysis of information gathered from the construction site to the headquarters and then to the final users who signed the contract with the construction company to build the construction. The IT solution implies the use of new technologies for communicating and centralizing the information, that simplifies the way information travels between departments and finally to the end-user, with the benefit of the Internet and VPN.*

Driven by factors such as globalization and changing business demands, modern enterprises have been forced to become increasingly **distributed**. In turn, they must support an ever-growing number of remote offices across the country and often around the world. Furthermore, enterprises need to make information and functionality available to workers at client sites, in hotel rooms, at home, and in remote offices, even if they are not connected to a network or the Internet.

A **distributed** architecture for data and **applications** can facilitate worker productivity irrespective of employees' location or connectivity. Moreover, decentralization mitigates the risk of loss during dropped connections or application and data downtime. Furthermore, a **distributed** architecture enables IT to allow mobile and remote workers reliable access to the **applications** they need; it can be a key aspect of supporting notebook computers and other mobile devices.

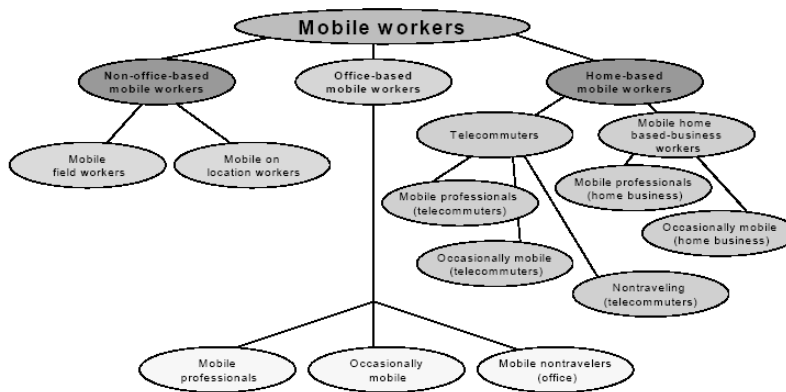
When migrating to a **distributed** architecture, organizations need to adopt a strategy that includes technical, business, and user dimensions. Maintaining this wider perspective helps companies avoid the pitfall of concentrating too heavily on the technical issues, as technology is only a means to accomplishing a business end. Since the Internet leveled the global playing field, most companies face competition from around the world. For many organizations, the current climate demands that they expand or lose ground.

Therefore, companies must decide which technologies to deploy to support business and end-user objectives moving forward. Many contrasting approaches exist, but a growing number of organizations are choosing to distribute **applications** and data to support a more flexible and scalable infrastructure.

## **The Mobile and Remote Workforce**

Organizations need to plan and build for the impact of increasing mobility. The U.S. mobile and remote workforce is growing at twice the rate of the overall workforce and will expand from 94 million in 2002 to 104.5 million in 2006. By the end of this period, mobile and remote workers will represent 66% of U.S. workers, up from 62.8% four years earlier. Similarly, mobile and remote workers in Western Europe will grow from 47.4% to 54.5% of the workforce during the same time frame. As shown in Figure 1, the expansion of the mobile workforce extends across the enterprise.

Figure 1  
Mobile Worker Population Hierarchy



The mobile and remote workforce includes maintenance workers, telecommuters, and branch office employees. From an enterprise computing standpoint, mobile workers are employees who require access to computing resources but work away from the central office and main IT infrastructure. Because mobile and remote workers comprise such a diverse group, they need access to a variety of applications and information. Therefore, many companies must provide access to specialized business applications that can be difficult to distribute, such as business intelligence, customer relationship management (CRM), manufacturing, and other vertical market applications. The one characteristic common to all mobile and remote workers is their need to be effective regardless of their location.

Therefore, they require:

- Access to the same data and applications available to coworkers in central locations
- Access in as close to real time as possible
- The ability to work reliably offline

### Approaches to Creating a Distributed Infrastructure

Organizations faced with supporting mobile workers and remote offices may find that they are not sure of the best approach. The several possible strategies for creating a distributed infrastructure include:

- **Client/server.** This approach provides workers with access to information and applications whenever they log in to the network. It generally relies on authenticating the computer being used to log in, usually a mobile laptop or remote office-based desktop PC.
- **Web-based applications/thin client.** This method allows users to log in via whatever Internet connection they have; it validates the employee, usually by a password, rather than the machine.
- **Distributed applications.** This category includes any application that does not need to run on any single server or environment. Distributed applications can be made available to users logging in via a variety of means. The defining attribute is not what the application does but how the users may access it.

The client/server and Web-based approaches share a main drawback: They require the user to have a live network or Internet connection to be fully functional. Computing resources, specifically enterprise applications and data, remain centralized; only small portions of the work actually utilize the remote machine. In contrast, distributed applications are available to users regardless of network or Internet connectivity and provide real-time access to locally stored data. Ideally, though, decentralized application components and data would be connected frequently enough to ensure that the information remains current and synchronized with centralized databases. As a result, a branch office that is cut off from the central database because of a dropped connection can continue business as usual. Replication and

synchronization will occur when the network connection is reestablished. Distributing computing across platforms, languages, and devices is becoming more feasible and more critical to achieving decentralized enterprise IT. Employees, customers, partners, and suppliers can be served whenever and wherever they log on, and they can work offline with the latest available data. Such an environment takes the components of a database management system (DBMS) – the software used to define and deploy databases that drive enterprise applications and are accessed by multiple users simultaneously – and divorces these components from the need to sit on a centralized server. This decentralization of applications and data provides improved applications access to remote offices and mobile workers.

### **Business Benefits of Distributed Applications**

Distributed applications improve performance by reducing structural inhibitors such as bandwidth/connectivity constraints, platform and server disagreements, incompatible firewalls, and the like. Though the technology potential engendered by this architecture is significant, enabling seamless and ubiquitous access for end users should be the driving rationale. Because distributed applications are a means to an end, companies should look at user and business benefits first when considering a distributed environment implementation. Each of these benefits is enabled by a technological advantage, but the technology should be secondary to the need to meet specific business objectives. Key advantages of distributed applications include:

- **Increased productivity.** Distributed application environments allow employees to work effectively from any location, even if they are not connected to the Internet or other network. To be productive, many knowledge workers need full application functionality and full data sets. Distributed applications also mitigate expensive downtime for remote workers while limiting the impact of central system failures and planned outages. Distributed applications also enable remote offices in rural areas and around the globe, which may have only intermittent and/or slow access, to achieve a consistent level of productivity.

**More effective remote and mobile workers.** Distributed applications don't just allow mobile and remote employees to do more; they enable these workers to do things they would not be able to do otherwise. These users should be able to perform the same functions, whether they are using horizontal applications, such as email and calendaring, more specific applications, such as sales force automation (SFA) or CRM, or even vertical-specific applications. Providing full access to these applications enables mobile workers to be more productive because they can work when traveling or when otherwise not connected.

- **Cost savings.** Distributed computing does not obviate organizations' investments in existing infrastructure. A prime goal of most distributed application environments is to extend the functionality of applications. Savings may also be realized by allowing enterprises to continue using existing hardware. Rather than investing in new machines to guarantee wireless connections and the like, organizations can preserve capital expenditures, such as desktop PCs in branch offices and notebook computers used by business travelers.

- **Improved business decisions.** One of the biggest problems mobile and remote users face is being "out of the loop." However, distributed application environments allow them to work with full data sets even when they are not connected. Workers in many different places can also work from the same data, preventing unnecessary information gaps.

- **Flexibility and scalability.** Organizations familiar with the standards and technology that enable distributed systems will be well positioned to extend information and functionality with greater ease. Moreover, as geographic and time limitations become less significant, expansion becomes less taxing on IT infrastructure.

### **How Distributed Application Environments Work**

Distributed application environments help transform a company's IT infrastructure into a flexible resource that branch office servers and individual users tap into as needed. Such environments essentially operate fully functional copies of the application and database in the branch office or on a notebook computer. Distributed applications also rely on IT standards to enable communication and interoperability for applications and hardware across the distributed application environment. Network transparency is an important characteristic of an effective distributed environment. This software capability prevents occasionally connected users from being impacted when moving between connected/online and

disconnected/ offline modes. Transparency enables users to work continuously rather than requiring them to stop and restart the application in an "offline" mode. Key technical ingredients for distributed environments include:

- **Data replication** software maintains a copy of a live database, allowing mobile and remote workers to have the information they need, when they need it; that is, work carries on even without network access. Essentially, the database can be broken into blocks, called slices, work sets, or data sets, enabling users to download only the information they need during the remote replication process.
- **Middleware** is a broad classification covering software that sits between components on a network and allows them to communicate. Typically, middleware handles specific types of interaction, such as integration, messaging, or transactions between applications or devices. Middleware can be used to manage mobile devices on a wireless network. It can also handle tasks such as data transfer continuity, replication, and synchronization, allowing seamless roaming during intermittent connections.
- **Synchronization** software allows independent, simultaneous changes to be made to the same data, across databases. It enables users in different locations to work from the same sets of data, while helping to prevent information-based confusion or disagreements, and improves data accuracy.
- **Security** standards/protocols, best practices, software, and hardware must be rolled into the deployment strategy from the outset. Data residing on mobile devices, transmitted through the air, or exposed through other vulnerabilities will require varying degrees of protection. However, whatever security strategy companies adopt, they will need to weigh the protection of data and applications against usability. The point is to create a more effective infrastructure for users, not one that is too limiting.

### **Considerations**

IT managers championing a strategic direction toward distributed computing will ultimately articulate their case from a business perspective. A shift into anytime/anywhere access will involve an initial investment. Over time, though, the advantages will contribute to greater opportunities for cost reduction and revenue generation. Factors that should be considered include:

- **Notebook computers.** Notebooks accounted for 22.6% of U.S. corporate PC sales in 2002. This number will rise to 29.2% in 2007 as companies use the improving economy to replace currently installed desktop PCs. Distributed application platforms will be a key aspect of supporting mobile employees using notebooks.
- **Data movement and replication (DMR).** This software enables retrieval and manipulation of data from multiple databases, even if they are in different locations or based on different platforms. Database replication software can make an exact copy of a live database. These tools allow IT departments to provide full data sets to remote users, even when the underlying databases are incompatible.
- **Bidirectional, automated synchronization.** Read-write data synchronization capabilities are essential for the distributed environment because they provide fully functional databases or data sets to occasionally connected users. Modifications to data are intelligently merged once the distributed systems are brought back online. Automated synchronization improves reliability and reduces application and data management.
- **Data subsets.** Enterprises need to be concerned about what and how much data users are carrying on their notebooks and laptops. For instance, they need to make sure that mobile workers are not burdened with 20 gigabytes of unnecessary information on their notebook computers. Enabling only the relevant data to be distributed, instead of the full data set, reduces the amount of data that is distributed and the associated storage and network bandwidth costs.
- **Standardization.** Relevant standards for data replication and synchronization are still in development. Ultimately, system and user requirements coupled with vendor support and industry adoption will help guide standards selections.
- **Other technical issues.** Complexity is a growing concern for many companies, especially after years of piling IT projects one atop the next. Many companies will be tempted to take a softer, Web services approach to avoid adding another layer of technical detail. Web services and serviceoriented architectures alone will not be enough because they do not address the need for local data and the ability to operate significant business logic without connectivity. Although Web services may prove useful as a means of

communication with other applications, any proposal for a distributed application environment should address ways to ease complexity and integration issues.

A distributed computing system consists of heterogeneous computing devices, communication networks, operating system services, and applications. As organisations move toward distributed computing environments, there will be a corresponding growth in distributed applications central to the enterprise. The design, development, and management of distributed applications presents many difficult challenges. As these systems grow to hundreds or even thousands of devices and similar or greater magnitude of software components, it will become increasingly difficult to manage them without appropriate support tools and frameworks. Further, the design and deployment of additional applications and services will be, at best, ad hoc without modeling tools and timely data on which to base design and configuration decisions.

Distributed application development describes a type of application architecture where functionality is distributed among multiple applications residing on the same computer or on multiple computers. When talking about distributed application development you're really talking about the communication among applications or application components. The benefits for distributing an application include functionality encapsulation within a discreet unit (divide and conquer) and the spreading of some of the application functionality across processors (more speed).

The most popular type of distributed application architecture today is what is known as a web application architecture. The typical web application architecture uses a web server (usually IIS or Apache) and a database server (ADS, Interbase, MS SQL, and Oracle are popular). You communicate with the database server by extending the web server. You can extend both IIS and Apache with a CGI stand-alone executable. For IIS, you can also extend it with an ISAPI/NSAPI DLL. For Apache, you can also extend it with an Apache Shared Module (DLL). The web application extension is what holds your business rules and communicates with the database server. The web server (either IIS or Apache) communicates with a browser either over the internet or on your private network.

A web application architecture is a great solution for surfacing data to employees in branch offices, vendors, and to the public. However, if what you want is a business database application used at a single location, you are better off with a traditional multi-user or client/server application. A traditional multi-user or client/server application can be more powerful and faster than the best web application.

The following are the leading standards used to create distributed applications:

Windows Application communication with DDE, OLE, ActiveX, COM, and .NET DLLs

DDE, OLE, ActiveX, COM, and .NET DLLs are all various ways Windows applications can communicate on the SAME computer. Dynamic Data Exchange (DDE) is an older Microsoft standard that is still supported today by many applications. DDE is primarily used for exchanging text and executing commands within the other application. Object Linking and Embedding (OLE) was the next logical evolutionary step after DDE and is still a viable solution today. OLE migrated into ActiveX controls. Component Object Model (COM), along with DCOM, is the most popular standard used today to create distributed Windows applications. COM and ActiveX controls are being replaced by the new .NET DLL and XML Web Services standards.

Client / Server and n-Tier Architecture

With a Client/Server architecture, you separate the GUI front-end from the database back-end. With this architecture the GUI front-end communicates with the database using the database's protocol. Usually Structured Query Language (SQL) is supported and used to "ask" questions about the data stored on the database server. The database server takes care of optimizing requests, backing up data, etc. By moving

functionality to a database server, you distribute the processing needs of the system your building to two tiers. With n-Tier development, you move functionality to three or more tiers.

#### Windows DCOM

DCOM, or distributed COM, is a Windows standard for communicating among applications that reside on separate computers.

#### CORBA (platform independent)

Common Object Request Broker Architecture (CORBA), like DCOM is also a distributed component model. However, CORBA is platform independent.

#### XML Web Services (platform independent)

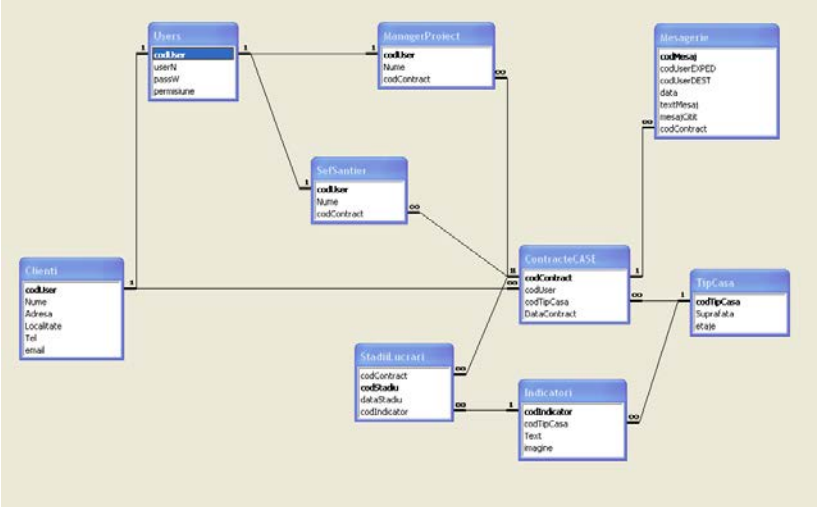
The new platform independent XML Web Services technology is changing the way applications and devices work together to build connected solutions.

#### Conclusion

Modern companies need to be able to let their employees work effectively from any location, with full access to data and applications regardless of connectivity. Distributed application environments can help enterprises accomplish this goal by providing componentized computing resources to branch offices and remote workers. Business advantages are central to companies that are looking at implementing distributed applications. Moreover, distributed applications enhance productivity and cost savings by enabling returns in technical areas such as:

- **Performance and scalability.** By removing architectural barriers and taking advantage of local resources and processing power, companies will find that adding new users, data, and applications to the mix is less cumbersome. Furthermore, users have access to what they need when they need it with reduced network latency and outage concerns.
- **Communication.** Bidirectional communication allows workers not just to read data but to do real work and make real changes while they are traveling. Achieving network transparency can be a significant benefit for highly mobile workers or for remote offices because users will be able to roam seamlessly between connected and disconnected modes.
- **Ease of use.** Distributed applications provide users with multiple ways of reaching applications and data. Meanwhile, automation allows workers to reap these benefits without constant manual replication and upgrade procedures.

The structure of a web based distributed application database for a construction company:



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